GPS Wireless Clock System
User Manual

Synchronized Solutions *for every type of facility*

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Product Description

The GPS Wireless Clock System automatically synchronizes clocks through a wireless radio signal. The GPS satellites transmit time information to a GPS receiver that sets the Transmitter's internal clock to the precise GPS time. The Transmitter rebroadcasts that time via a radio signal to system clocks in the system.

As a result, all clocks in the wireless system are precisely synchronized to each other and to the U.S. Government's official NIST time standard, Coordinated Universal Time (UTC). All components of The GPS Wireless Clock System are routinely updated to ensure both precision and synchronization.

System Components

GPS Receiver

The Global Positioning System (GPS) Unit has a sensitive antenna that receives the precise time (UTC) from the GPS satellite transmission. The GPS Receiver must have an unobstructed "view of the sky" to receive the signal.

GPS/Transmitter Extension Cable

A specially designed low-resistance data cable is available upon request to extend the distance between the GPS Receiver and the Transmitter. The GPS Receiver continuously sends the precise time through the cable to the Transmitter.

Transmitter

The Transmitter receives the time from the GPS Receiver and synchronizes to the precise NIST time. The Transmitter continuously broadcasts its GPS synchronized time to the system clock(s). The Transmitter operates at 72 MHz and is preset to one of the 16 channels, licensed by the FCC and IC, to minimize interference on these frequencies and channels.

Safety Precautions

Warning: The Transmitter is designed for indoor use only, and is not weather protected. Operating the Transmitter outdoors during adverse weather conditions is an electrical hazard, may damage the Transmitter, and nullifies the warranty.

Warning: Standard acceptance procedures must be followed prior to operating this equipment in the proximity of life support systems.

Equipment Precautions

Warning: To avoid static shock and possible damage to the Transmitter, make sure that you are electrically grounded before touching either the Transmitter antenna or case.

Warning: Never operate the Transmitter without the antenna being properly connected to the Transmitter. Operating the Transmitter without an antenna can destroy the Transmitter's power output.

Transmitter Display

The Transmitter has a lighted front display that shows important information.

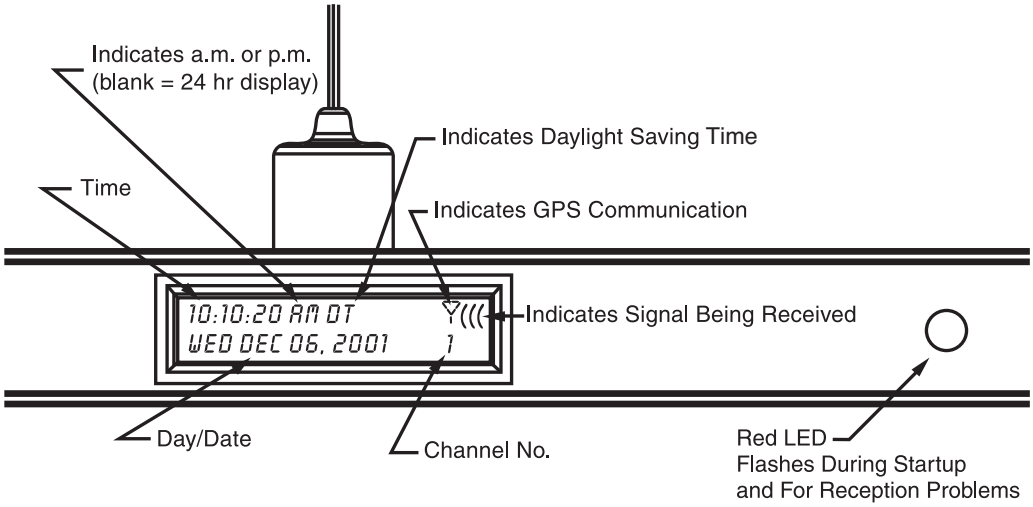


Figure A - Front of Transmitter

Time

Displays the precise time received from the GPS Receiver. If AM or PM is on the display, then the 12-hour option is selected. If neither AM nor PM is on the display, then the 24-hour option is selected.

Daylight Saving Time

The letters "DT" (Daylight Saving Time) or "ST" (Standard Time) will be displayed when adjustment for Daylight Saving Time is active. If neither "DT" nor "ST" is displayed, then switch #3 is in the down position and the Transmitter will not adjust for Daylight Saving Time.

GPS Communication

The GPS Communication indicator (see Figure A) will appear when the Transmitter is communicating with the GPS Receiver. The parentheses indicate the time signal is being received.

Day/Date

Displays the day and date received from the GPS satellite.

Channel Number

Displays the channel number (1-16) that the Transmitter is set to.

Red LED

The red LED (Light Emitting Diode) is located on the right side of the front panel of the Transmitter. The LED flashes on initial setup until a GPS time signal is received or when a severe GPS Receiver signal problem has occurred and no time data has been received from the GPS Receiver in 48 hours. See the Troubleshooting section of this manual for more information.

Transmitter and GPS Receiver Location

The first step in setting up the Transmitter is to determine a suitable location for the Transmitter and GPS Receiver. Location is extremely important to ensure the best operation of the system. You must consider the following:

Clear view of sky - The GPS Receiver needs a clear view of the sky to receive the GPS signal. Typical locations of the GPS Receiver are on the inside of a window (not a Low-E glass window), an exterior pole, or on a rooftop.

NOTE: The GPS Receiver should be away from metal objects, satellite dishes, etc.

Close to electrical outlet - The Transmitter's transformer power supply requires 120 Volts AC. Be sure that there is an electrical outlet within 4 feet of the transmitter.

Away from large metal objects - The Transmitter should be located a minimum of 2 to 3 feet above the floor and away from large metal objects such as lockers or filing cabinets.

High elevation - In multi-story buildings, locating the Transmitter on the top floor will often significantly improve coverage for the lower floors due to the "umbrella" pattern of transmission.

Protected from weather –

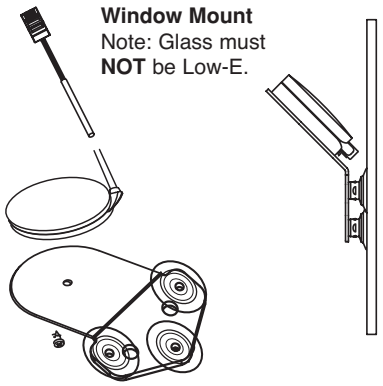
Warning: It is imperative that the GPS Receiver and the connection to the GPS cable be above any potential standing water, snow depth, leaves or other obstructions. Connections outside must be sealed with a high quality silicone sealant.

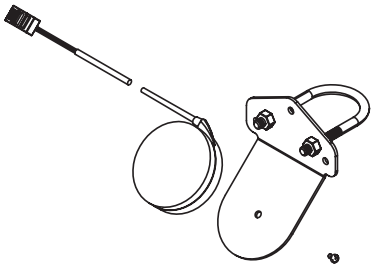
Warning: The Transmitter is not weatherproof and must be located indoors. Operating the Transmitter outdoors during adverse weather conditions is an electrical hazard, may damage the Transmitter, and nullifies the warranty.

For installation examples, see Figure B. The GPS Receiver and the attached cable are weatherproof and may be mounted outside. If additional cable is required, the connection must be sealed with a high-quality silicone sealant (such as Radio Shack Sealant 278-1645 for Outdoor RF Connections) to weatherproof the connection. Various lengths of cable are available from Primex Wireless.

Setup of the Transmitter

1. Attach the GPS Receiver to the inside of a non Low-E glass window, outside pole, or rooftop that has a clear view of the sky (see Figure B). Route the GPS Receiver cable as needed. When attaching the GPS Receiver to the inside of a window, clean the windowpane before using the suction cups for attachment. If the GPS cable is run through conduit, a minimum inside diameter of 1.5” is recommended.





Pole Mount

ITEM	QTY	DESCRIPTION
1	1	GPS 18 LVC & Connector Asm
2	1	Mounting Bracket Rev. C
3	2	M3 x 0.5 x 6mm PH Screw
4	3	#6 x 3/8 Sheet Metal Screw
5	3	Suction Cup
6	1	U-Bolt w/nuts (11746 Ref), for 1" Pipe

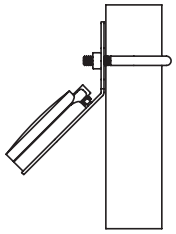
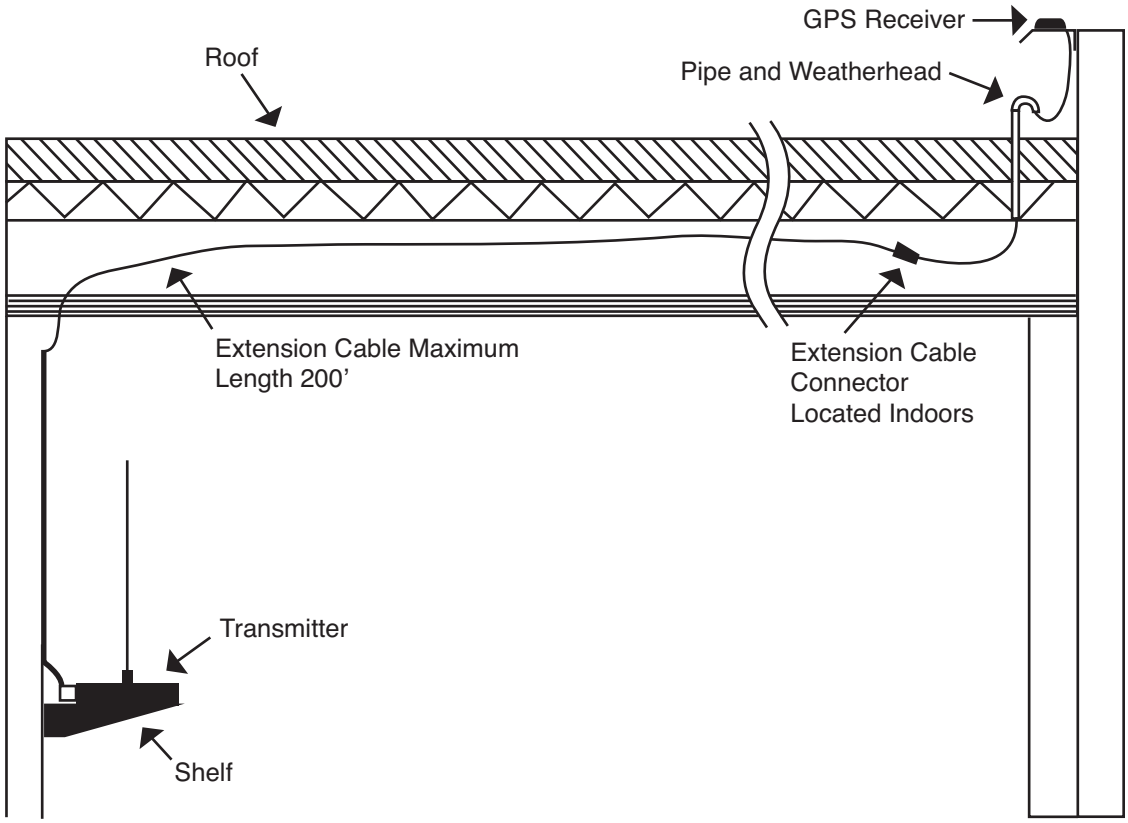


Figure B - Mounting of GPS Receiver



2. Carefully screw the Transmitter antenna onto the Transmitter. Turn the antenna clockwise, being careful to avoid cross-threading the antenna. The antenna must be snug and flat against the case.

Warning: Do not over-tighten the antenna. Hand-tighten only.

3. Plug the included DB9/RJ45 GPS conversion adapter into the GPS socket located in the back of the Transmitter (see Figure C).

4. Plug the GPS cable into the GPS conversion adapter.

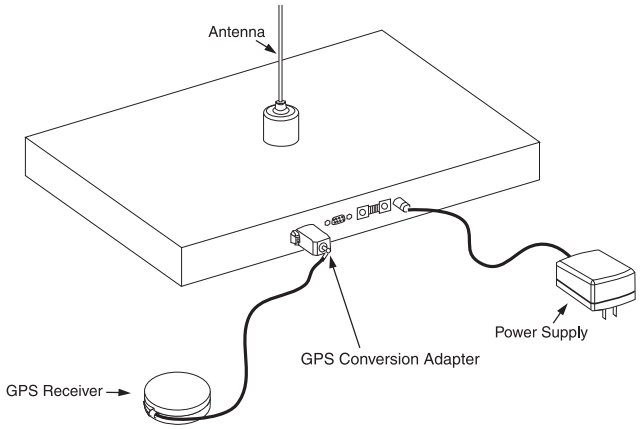


Figure C - Setup of Transmitter

5. Set the switch preferences located on the back of the Transmitter (see Figure D). The Transmitter continually checks the position of the switches. The switches select time zone, channel number, 12- or 24-hour display, and the observance of Daylight Saving Time.

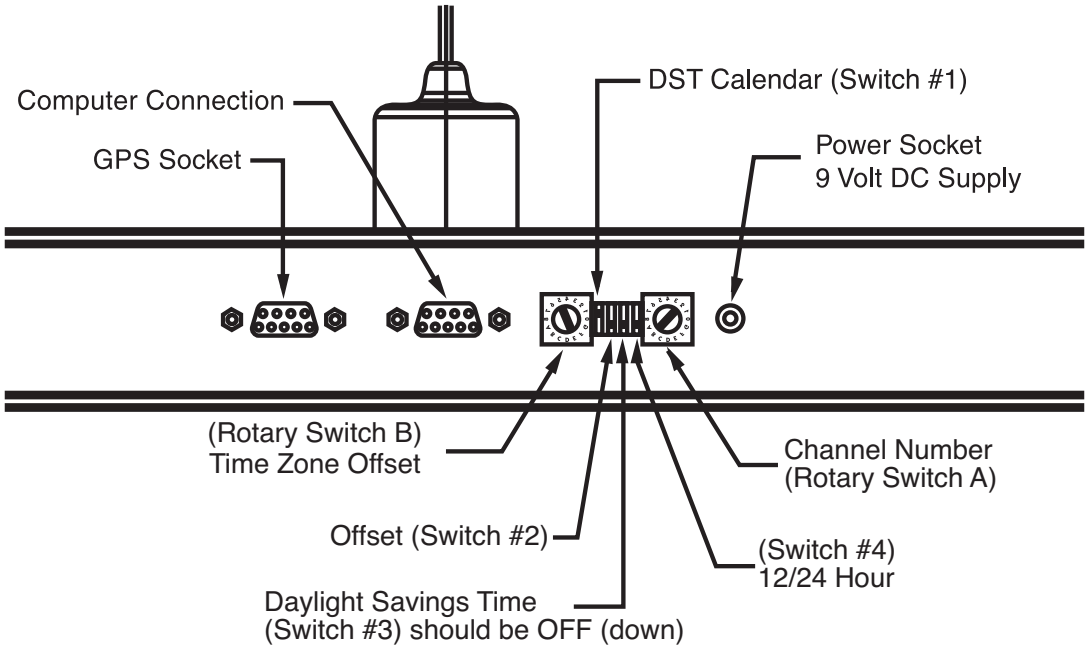


Figure D - Switch Settings

a. Rotary Switch A (channel selection) is factory preset to the FM frequency on which the Transmitter will broadcast.

Warning: Do Not adjust this switch. It is only to be set to the frequency specified on the FCC/IC application.

There are 16 available channels. The chart below explains which switch positions correspond to which channel numbers.

Switch No.	Channel No.
0	16
1	1
2	2
3	3
4	4
5	5
6	6
7	7
8	8
9	9
A	10
B	11
C	12
D	13
E	14
F	15

b. Rotary Switch B selects the time zone. Use a small slotted screwdriver to adjust the rotary switch.
- "4" for Atlantic Time Zone
- "5" for Eastern Time Zone
- "6" for Central Time Zone
- "7" for Mountain Time Zone
- "8" for Pacific Time Zone
- "9" for Alaska Time Zone
- "A" for Hawaii Time Zone

c. Switch #1 sets the Daylight Saving Time Calendar.
- Up to automatically change to the new Daylight Saving Time calendar in 2007.
- Down to abide by the old schedule in 2007.

d. Switch #2 sets the direction of UTC offset.
- Up for U.S.
- Down for Europe

e. Switch #3 sets the automatic Daylight Saving Time adjustment.
- Up for automatic Daylight Saving Time changes
- Down to bypass Daylight Saving Time adjustments

f. Switch #4 sets the clock display on the Transmitter.
- Up for 12-hour display
- Down for 24-hour display

6. Plug the supplied 9 Volt 2.0 Amp DC power supply (transformer) into the Transmitter.

7. Plug the power supply (transformer) into a 120 VAC outlet.

Transmitter setup is complete. See **Transmitter Operation** for details of operation.

Transmitter Operation

The following assumes that the Transmitter has been properly set up as described in **Setup of the Transmitter**.

Basic Operation of the Transmitter

When power is first applied to the Transmitter, the front display will light up and show important information. The red LED light will flash until the Transmitter receives a valid time signal from the GPS Receiver.

The display will initially show the time as 12:00:00 and will note the software version. Then the Transmitter checks the position of the switches on the rear of the Transmitter and stores their settings in memory. The Transmitter then sends information to the GPS Receiver and waits for time information from the GPS Receiver.

The GPS Communication indicator (see Figure A) will appear when the Transmitter is receiving a signal from the satellite through the GPS Receiver. If the symbol is not displayed, see **Troubleshooting**.

The time on the display will increment once each second until the GPS Receiver sends the transmitter a valid time. The GPS Receiver needs to “see” 3 satellites in the sky above before it will send a time signal to the transmitter. This may take up to 15 minutes for a GPS Receiver that has a 360° view of the sky. The length of time is dependent on the location, weather conditions, time of day, etc. In areas where the unit does not have a full view of the sky, due to wall or window installations, building “shadows”, etc., this may take up to several hours.

Note: The Transmitter does not transmit time data until it has received valid time information from the GPS Receiver.

Once the Transmitter receives the GPS Receiver time signal, the Transmitter sets its internal clock to that time and will display the correct time and date. The Transmitter then begins transmission of its internal time once every second. The transmission signal is a maximum one-watt FM signal at approximately 72 MHz. The Transmitter continually monitors the GPS Receiver and the Transmitter updates its internal clock with the time data it receives.

The number to the right side of the display is the channel number to which the Transmitter will be transmitting the time signal.

Warning: The channel number must be the same as the channel number specified on your FCC/IC license. If not, you must immediately adjust the channel to the number that corresponds to the FCC/IC license.

Note: If the Transmitter receives no valid time data from the GPS Receiver for 48 hours, then the red LED on the right side of the front panel will flash.

Daylight Saving Time

The Transmitter is pre-programmed to automatically make adjustments for Daylight Saving Time. The letters "DT" (Daylight Saving Time) or "ST" (Standard Time) will be displayed when adjustment for Daylight Saving Time is active (switch #3 in the up position). If neither "DT" nor "ST" is displayed, then switch #3 is in the down position and the Transmitter will not adjust for Daylight Saving Time.

The adjustment to Daylight Saving Time and back to Standard Time take place 2:01 AM on the day of change.

Note: The GPS signal does not encode information about Daylight Saving Time. In the spring when the Transmitter changes to Daylight Saving Time, the system clocks will adjust by advancing faster then their normal speed to make the adjustment and then return to normal operation. In the fall when the Transmitter returns to Standard Time, the system clocks will make the time adjustment and then return to normal operation.

Selecting Your Time Zone

The time zone of your location is not shown on the display. However, when the Transmitter has received a valid time from the GPS Receiver, the correct time zone can be checked by verifying that the correct hour is displayed. The Transmitter can be set for all 24 time zones around the world and 1/2-hour time zones.

12-Hour or 24-Hour Time

The 12/24-Hour option only affects the Transmitter's LCD display. If AM or PM is on the display, then the 12-hour option is selected with switch #4. If neither AM nor PM is on the display, then the 24-hour option is selected. Analog System Clocks are 12-hour clocks. LED Digital System Clocks have a selectable jumper option to display either 12-hour or 24-hour time regardless of the Transmitter's 12/24 option setting.

Continuing Operation

The status of the GPS Receiver is indicated by the GPS Communication indicator. When the "Y"-like symbol is displayed, the GPS Receiver is connected to the Transmitter and there is proper communication between the GPS Receiver and the Transmitter. When the Transmitter is receiving valid time data from the GPS Receiver, the three parentheses will sequence in a motion pattern. If these symbols are not displayed, see **Troubleshooting**.

Power Failure

The System has a fail-safe design. If the failure of a system component or power loss to a component occurs, all down stream components continue normal operations using their own internal time base. If after a specified period, communication has not been restored, a visual that indicates a loss of communication appears and remains until communication is restored. Examples: Red flashing LED on the Transmitter; flashing colons on LED digital clocks; double stepping of second hand on analog clocks.

Troubleshooting

Transmitter Problems

The first step in troubleshooting the Transmitter is to reset the Receiver. If the Transmitter fails to receive a GPS signal and is set to time within 15 minutes, please reset the Transmitter.

Note: The Transmitter does not have an ON/OFF switch. To reset the Receiver, unplug the power supply and then plug the unit back in.

Power glitches, line spikes, power interruptions, static discharge or other voltage fluctuations can cause loss of communication with the GPS Receiver if the disruption occurs during the initial setup communication between the Transmitter and the GPS.

Note: The time of day, view of the sky, weather, solar flares and local interference also influence signal reception and can cause temporary loss of the GPS signal. If reception problems persist, see Signal Reception Problems.

Display Does Not Light Up

If the display does not light up, check the power supply connection to the Transmitter and to the 120 VAC outlets. Verify that the AC outlet has power. Also, verify that the correct power supply is used (9V, 2.0A). If this does not correct the problem, either the power supply or the Transmitter is defective. Call Primex Technical Support at 1-800-404-8112.

Display Lights Up, But Is Blank or Very Faint

Call Primex Technical Support at 1-800-404-8112. The Transmitter will probably need to be replaced.

Signal Reception Problems

1. Verify that the GPS Receiver is properly connected to the Transmitter.

2. Verify that the GPS Receiver is properly mounted on a non-Low-E glass window or on a rooftop or pole outside with a clear view of the sky.

3. Check to assure that the GPS Communication indicator is showing on the display (looks like a "Y" with a line over it). If this symbol is displayed, then the Transmitter is communicating with the GPS Receiver.

   a. If the GPS Communication indicator is not being displayed, then the Transmitter, GPS Receiver, or the connection between Transmitter and GPS Receiver is defective. Check GPS cable connections.

Note: The use of unshielded or standard shielded cables to extend the distance between the GPS Receiver and the Transmitter beyond 50 feet can cause this failure mode. A special shielded cable with low resistance on the voltage supply line is required for distances over 50 feet. The maximum distance using the special cable is 200 feet. If cable connections are good, replace the GPS Receiver.

   b. If the GPS Communication indicator is displayed but the parentheses are not flashing, then the problem is with the GPS Receiver or with its signal reception.

      i. Check to make sure that the GPS Receiver has a clear view of the sky and that its view is not obstructed.

Note: Double pane Low-E glass windows are coated with a transparent metal layer that reflects infrared heat rays; this will also reflect the GPS signal. The GPS Receiver will not receive the signal through Low-E windows.

      ii. Local interference can affect GPS reception. Try moving the location of the GPS receiver to improve reception.

      iii. Weather conditions, solar flares, time of day, and exact satellite position may also effect signal reception; however, these conditions are normally of a short duration.

Note: When certain types of electronic light ballasts become defective they may radiate broadband noise, which can interfere with wireless devices. While interference issues are unlikely with the Primex Wireless Clock System, high levels of noise present in the 72-76MHz range could potentially cause clocks which are located far from the transmitter and also within the close proximity of these ballasts to not receive a signal. Very limited instances have occurred in the past, which has only been found to happen when ballasts become defective.

Displayed Time/Date is Incorrect

1. If the minutes and seconds are correct, but the hours are off or the day is off, then switches #2, #3, or Rotary Switch B are in the wrong position. Correct switch settings. See Switch Settings for proper settings.

2. Other than for the above reason, or the loss of the GPS signal, the Transmitter, whose time is controlled by a GPS signal, should never display the wrong time or date. If such an event occurs, please contact Primex Wireless Technical Support at 1-800-404-8112.

Extremely Weak Transmitter Power (About 100 Feet or Less)

1. Unplug the Transmitter and ground yourself to eliminate static electricity.

2. Check to make sure that the antenna is not cross-threaded. The base of the antenna must be flat on the Transmitter case.

3. Check to make sure that the antenna rod is secure in the antenna base (hand tighten only).

4. Check to make sure that the base of the antenna is tightly mounted on the Transmitter case.

5. Check to make sure that the antenna is not touching anything.

6. Plug in the Transmitter. If the Transmitter power is still extremely weak, the output stage of the Transmitter may have failed. Contact Primex Wireless at 1-800-404-8112.

Weak Signal (Limited Coverage Area)

The coverage area is determined by many factors. One of the primary factors is the transmitted signal compared to the background interference. For the clocks to receive a clear signal from the Transmitter, the signal must be several times stronger than the background interference. Therefore, Transmitters located in areas with generally higher background interference will have reduced coverage. If background interference is causing a problem, please contact Technical Support at 1-800-404-8112.

Red LED is Flashing

The Red LED flashes when the unit has not received an updated time signal for 48 hours. It will also flash during initial setup.

1. Check the GPS Receiver and its cable for proper connection to the Transmitter and possible damage to the cable. Check the mounting of the GPS Receiver to ensure that the mounting did not slip or change and that it has an unobstructed view of the sky.

2. Check the display panel for the GPS Communication indicator. If the symbol is there, re-check the location of the GPS Receiver and its view of the sky and resolve any obstructions. Then disconnect power from the Transmitter, wait five seconds and reconnect power to the Transmitter.

3. Check the display panel for the GPS Communication indicator. If the symbol is not there, disconnect power from the Transmitter, disconnect the GPS Receiver from the Transmitter, and check the GPS cable and connections. Then reconnect the GPS Receiver to the Transmitter and reconnect power to the Transmitter. If the GPS Communication symbol still does not appear in the display, replace the GPS Receiver.

Federal Communications Commission (FCC) and Industry Canada (IC) Information

Compliance Statements

This device complies with Part 90 of the FCC rules. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

This device complies with Part 15 of the FCC rules and with RSS-119 of Industry Canada. Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference received, including interference that may cause undesired operation.

Canada IC: 4256A-FM72 (TX/RX/LED)

The term "IC:" before the certification/registration number signifies only that the Industry Canada technical specifications were met.

Warning: Changes or modifications to any Primex Wireless GPS Wireless Clock System components not expressly approved by Primex Wireless (the party responsible for compliance) could void the user's FCC authority to operate the equipment.

Radio Frequency (RF) Exposure

To comply with FCC/IC RF exposure requirements for mobile transmitting devices, the Transmitter is only to be used or installed in locations where there are at least 20cm (approximately eight inches) separation distance between the antenna of the Transmitter and all persons.

License Requirements

Operation of the Transmitter requires an FCC operating license that must be renewed every 10 years. Industry Canada (IC) licenses must be renewed annually. Prior to operating the Transmitter, an application must be flied with the FCC/IC and it can only be operated on that specified channel. Prior to receiving the Transmitter, filing and licensing will normally have been completed by Primex Wireless. If not, you are required to file the required application with the FCC/IC prior to use. If you have any questions or need assistance, please contact Primex Wireless at 1-800-537-0464.

Altering the Transmitter antenna or case is prohibited by FCC/IC regulations. The FCC/IC also requires that the Transmitter antenna be attached to the case and that the antenna be vertical with respect to the earth.

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